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THE MIAMI CONSERVANCY BULLETIN

FEBRUARY 1920

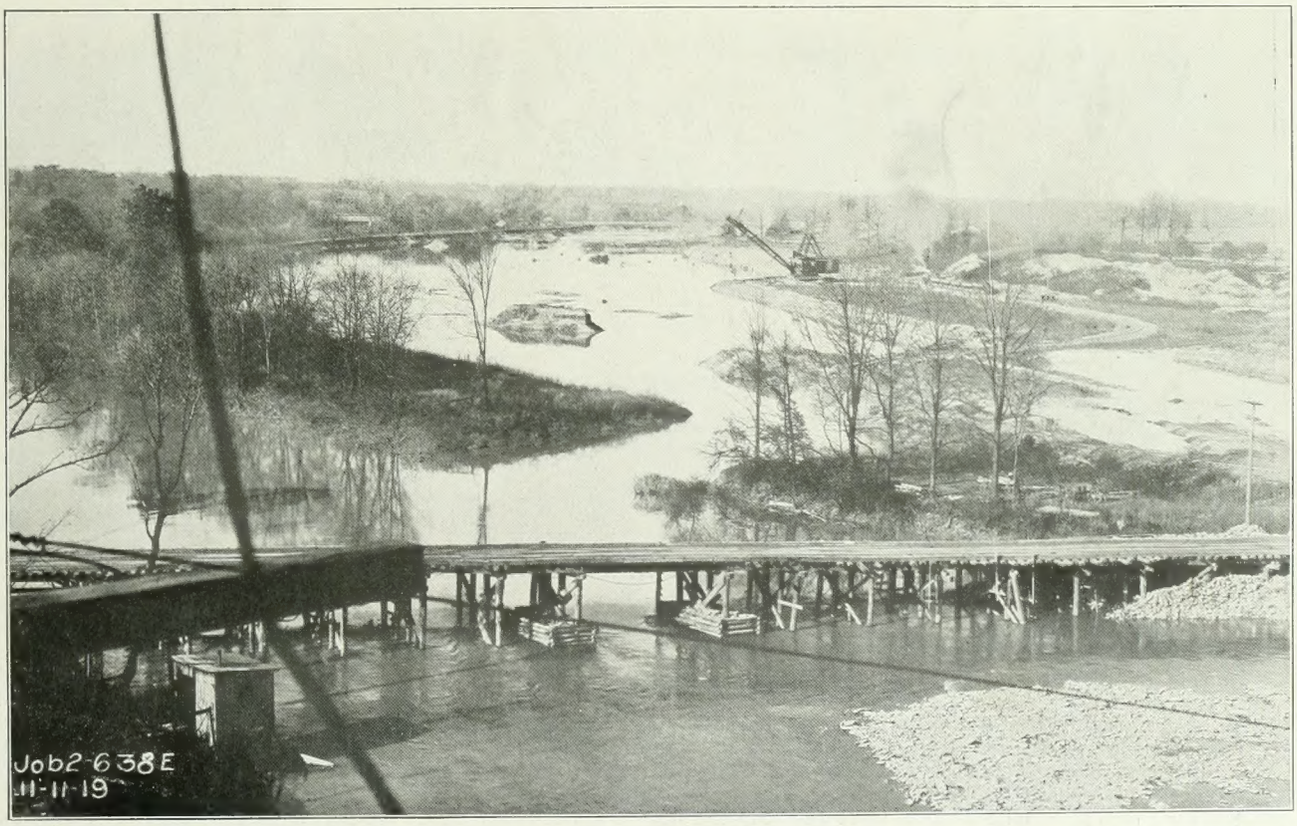

FIG. 83—BORROW PIT AT ENGLEWOOD DAM, NOVEMBER 11, 1919

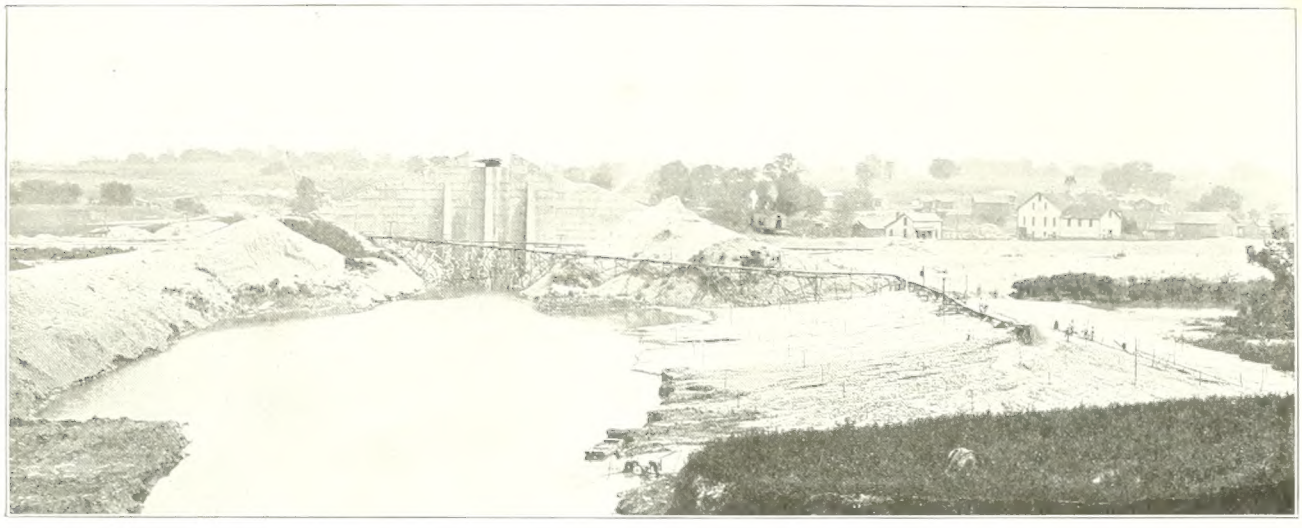

FIG 84—THE CORE POOL AND SOUTH BEACH, LOCKINGTON DAM, AUGUST 11, 1919

At this stage, the hydraulic fill was being put in through one line of dredge pipe only, which was carried along the south beach. The pipe line comes from the pump house beyond the walls in the distance, crosses the pool on a trestle as seen, then turns and is carried along the south levee. The discharge is seen coming from the near end of the pipe and flowing down the slope toward the near end of the pool. See page 106. The water in the pipes flows about 15 feet per second and carries earth, sand, gravel, and stones up to six inches in diameter. The stone, sand, and gravel are deposited on the slope of the beach. The finer particles, mostly clay and silt, are carried on into the pool, where they drift out into the quiet water and are carried often to considerable distances. The finest are carried to the farthest corners of the pool. Some of these never settle, but are carried out in the discharge. Most of them, however, sink slowly to the bottom of the pool as mud, which thickens and consolidates as fresh layers are deposited from the pool water, and ultimately become solid and impervious. The excess water in the pool runs out through an opening next the wall in the distance. The picture shows only the middle section of the dam, which lies west of the outlet, the latter being just beyond the wall. The earthen part of the dam east of the wall has not yet been built. See also Fig. 98.

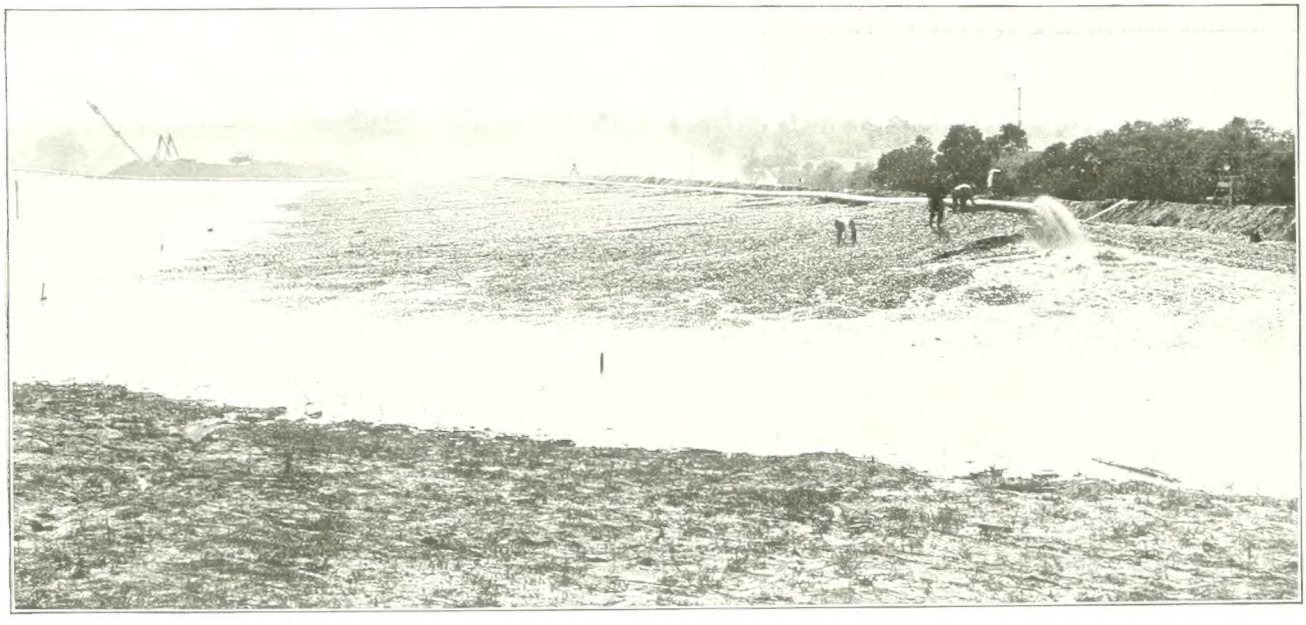

FIG 85—THE CORE POOL AND NORTH BEACH, ENGLEWOOD DAM, AUGUST 26, 1919

This picture was taken on the same day as that shown in Fig. 90, page 106, and shows the right-hand pipe line and discharge seen in that picture. It should be studied in connection with the explanation on pages 106 and 108. The building up of a cone of coarse material at the mouth of the discharge pipe may here be clearly seen, although the process of building it is only just beginning. The stones and gravel gradually build up 'till they reach the level of the pipe, the beach along which the stream of discharge water flow to the pool slowly building up at the same time. The slope of the beach is that naturally taken by the materials, being flatter with finer materials and steeper with coarse. The levee or low bank seen at the right of the pipe line is to prevent the water flowing down the outside slope of the main dam embankment which is just beyond it. The little house just above and to the right of the men (see also Fig. 92), is a field telephone booth which connects with the pump house at the foot of the dam in the distance. It is used to tell the pump attendant when to start and stop the flow of material through the pipe, stoppage being necessary whenever the beach under the pipe has been built up to the level of the pipe bottom. A fresh pipe length is then added and the pumps started again. A very simple indicator, devised by the chief electrician at Englewood, is carried on the end of the discharge pipe. This connects through an electric wire with a red signal lamp on the pumphouse switch board, which goes out whenever the pressure drops below normal.

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MIAMI CONSERVANCY BULLETIN
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Subscription to the Bulletin is 50 cents per year. At news stands 5 cents per copy. Business letters should be sent to Office Engineer, Miami Conservancy District, Dayton, Ohio. Matter for publication should be sent to G. L. Teeple, Miami Conservancy District, Dayton, Ohio.

Conservancy Farms for Sale

We carry this month on the inside of the back cover an advertisement which is worth the attention of any person who thinks of buiying a farm. The lands there listed comprise only a small portion of the farms which as time goes on will be offered for sale. It is the intention to publish in the Bulletin, from now on, brief descriptions of these farms (totalling about 30,000 acres), as they are made ready for the market. They comprise some of the best lands in the Miami Valley.

The Germantown Dam Up to the 1913 Flood Level

It is a pleasure to announce that by the time the Bulletin arrives in the hands of its readers the Germantown Dam will be up to the 1913 flood level. Work on this dam has been pushed on into the winter, at some additional trouble and expense, in order to achieve this result, the engineers having in view the possibility of heavy spring floods which might endanger the uncompleted dam structure itself as well as property in the valley below. The coming season ought to see the Germantown dam, as well as that at Lockington, practically completed.

Plastic Fill at Taylorsville

Hydraulic engineers will find the article on page 101 of interest. The cross dam at Taylorsville, built by a method apparently hitherto little used, aroused the especial attention of the visiting engineers who were here last June, and its successful completion is worth calling to the notice of those members of the profession who have not had an opportunity of visiting the work. As the article brings out, the plastic fill method is not applicable in all cases, requiring apparently a certain suitability of the material. Where it is applicable its superiority in speed and inexpensiveness, due in part to the fact that the work can be driven ahead in all weathers, should bring it into wider use than it has had hitherto.

Experiments With Contracted Channels

Engineers will also be interested in a paper by E. W. Lane, Assistant Engineer with the Conservancy organization, describing the results of experiments made in Dayton sometime ago, on the flow of water through different types of contracted openings in channels. These experiments have a bearing on the work of the Conservancy in the confirmation which they bring regarding the validity of certain modifications in the usual formulas, made by Professor S. M. Woodward, Consulting Engineer of the District, in calculating the 1913 flood flow; this flow forming, of course, the basis for the design of the retarding basins and improved river channels. Mr. Lane's work has a further value in demonstrating, by mathematical analysis of the results of his experiments, that certain facts regarding water flow through contracted openings, hitherto passed over as not being amenable to such analysis, really follow as a result of well known fundamental laws. Mr. Lane's paper is published in the October-December number of the Proceedings of the American Society of Civil Engineers, to which we commend our readers.

The Englewood Borrow Pit

The picture of the Englewood borrow pit, shown on our outside cover, is of interest as indicating how the Stillwater River valley above the Englewood Dam is going to look when that structure is completed. It might be described as "the hole in the ground made by 800,000 cubic yards of dirt," that being the quantity of earth removed at the time the picture was taken. This quantity is now over a million cubic yards, all of it excavated during the past season. The total amount to be removed from this pit being 3,500,000 cubic yards, the picture gives some idea of the lake which, when the dam is finished, will adorn the landscape in the valley above. This work has all been done by dragline excavators.

Winter Work on the Hydraulic Fill

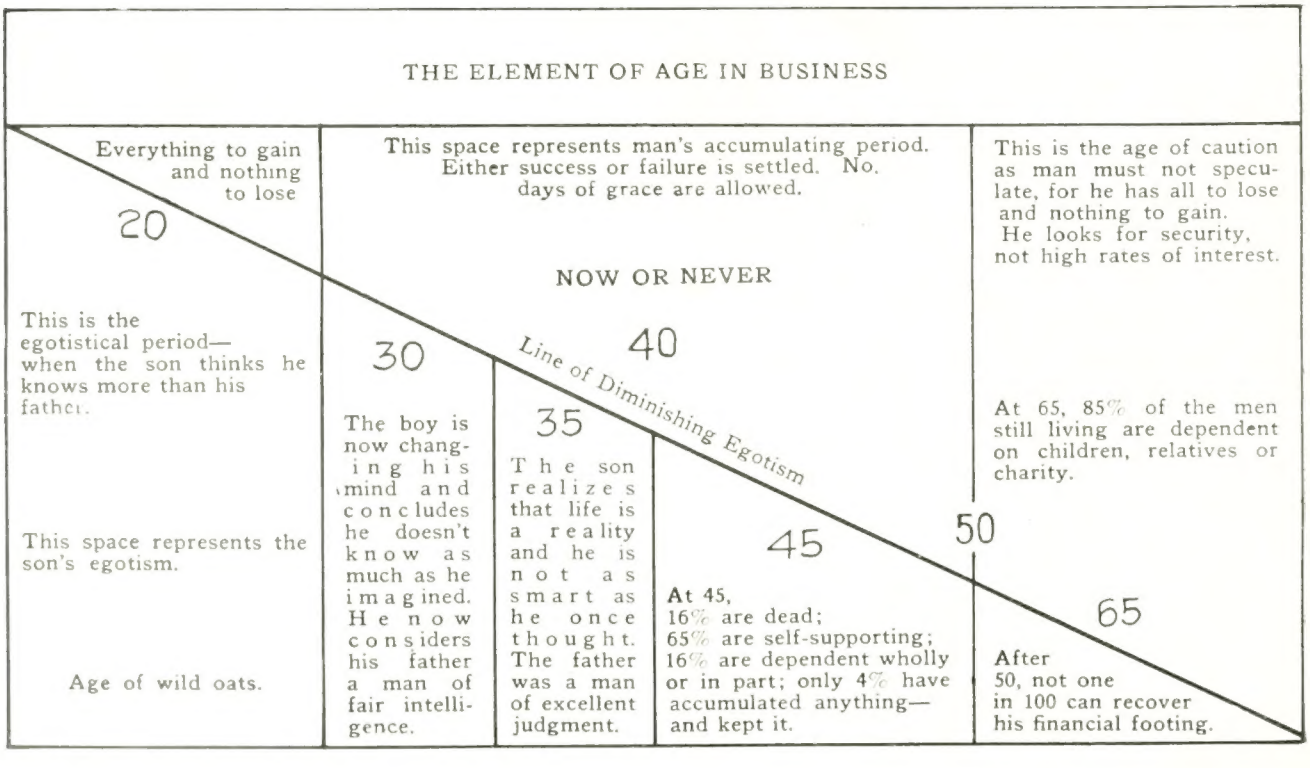
The early setting in of the season of cold weather, with spells of rather extreme severity, made it advisable to close down the work of hydraulic fill at most of the dams until spring. There are several reasons for this. One of them is the difficulty of keeping the pipes from freezing. Layers of ice will form inside the pipes, gradually filling them up and making a shut-down necessary until they are thawed. Protective coverings might be applied, but at considerable expense. A second difficulty is that of keeping the men at such cold, wet work, with water spraying from the pipes and in the borrow pits, which rubber boots and mackintoshes will not entirely keep out. A third difficulty is the freezing of the wet bank of earth which forms the borrow pit face. Water from the monitor will freeze on this face, forming an icy armour which the jet can penetrate with extreme difficulty. These and other considerations have made it expedient to shut down the hydraulic fill machinery at all the dams except Germantown, and devote the winter season to such other work as can be efficiently pushed forward, especially the putting of all equipment in a state of first-class condition for rapid work when spring opens. At Germantown the expediency of pushing the dam embankment up to the 1913 flood level to guard against possible spring floods, as noted elsewhere, has operated to keep the work going.

Boyhood of Abraham Lincoln

Readers of the Bulletin will find it well worth their while to read the article by Chief Engineer Morgan which appears in the February number of the Atlantic Monthly, in which he gives certain interesting new data regarding the boyhood of Abraham Lincoln. Mr. Morgan discovered a man in the Ozark Mountains in Arkansas, who was a second cousin of Abraham Lincoln, and as a baby had been carried in Lincoln's arms, his mother being a cousin of the future President, and living at the time in the little log cabin in Indiana which time has made famous. Historically, the main importance of the article, perhaps, is as a corrective to what seems to be the prevalent idea that Lincoln's father was a somewhat shiftless character. Mr. Morgan's portrait shows him as a man much like his neighbors, living simply under the primitive conditions common to the locality and period. The article is an original contribution to Lincoln literature, notable for the impression is gives of perspective, fidelity and accuracy.

The Element of Age in Business

We commend the chart below, bearing this title, to all our readers. It was brought to our attention by Mr. Locher, our Construction Manager, who was impressed with its truth and with its timeliness in the present period of too lavish and spendthrift financial expenditure. It is the financial gospel in a nut shell, and as such worthy of careful study.


THE ELEMENT OF AGE IN BUSINESS
Everything to gain and nothing to lose
20
This is the egotistical period—when the son thinks he knows more than his father.
This space represents the son's egotism.
Age of wild oats.
This space represents man's accumulating period. Either success or failure is settled. No days of grace are allowed.
NOW OR NEVER
30
The boy is now changing his mind and concludes he doesn't know as much as he imagined. He now considers his father a man of fair intelligence.
40
Line of Diminishing Egotism
35
The son realizes that life is a reality and he is not as smart as he once thought. The father was a man of excellent judgment.
45
At 45, 16% are dead; 65% are self-supporting; 16% are dependent wholly or in part; only 4% have accumulated anything—and kept it.
50
This is the age of caution as man must not speculate, for he has all to lose and nothing to gain. He looks for security, not high rates of interest.
At 65, 85% of the men still living are dependent on children, relatives or charity.
65
After 50, not one in 100 can recover his financial footing.

Plastic Fill at Taylorsville Dam

35,000 Cubic Yards of Cross Dam Successfully Built by a Hitherto Little Noticed Process Which Takes the Place of Rolled Fill.

In building the section of the dam at Taylorsville, west of the river, it was necessary to construct a cross dike along the west bank of the stream, to enclose one end of the core pool. To build this cross dam an interesting process was employed, which may be called, to distinguish it, the process of "plastic fill." The aim was to build an embankment which should be stable and impermiable to water, and as reliable as rolled fill while far less expensive to construct. It is believed that the work at Taylorsville has successfully demonstrated that with proper materials this can be done.

The cross dam referred to was originally planned to be built by the rolled fill process, and at the start that process was indeed used, the lowermost portion, two to five feet in thickness, and amounting to about 11,000 cubic yards, being spread, wetted and rolled in six-inch layers in the regular manner. The work was begun August 5, 1918, but by September 11 the engineers in charge made the change to the new method, the cost for the rolled embankment, following the upward trend of all prices, having been around $1.00 per cubic yard. It was believed that the new method would give not only a solid and impermiable structure at less expense, but would result in a material speeding up of the work, wet weather, which completely stops rolled fill, having caused a great deal of annoying delay. The placing of the plastic fill, by adjusting the quantity of water injected into the material, can be carried on rain or shine.

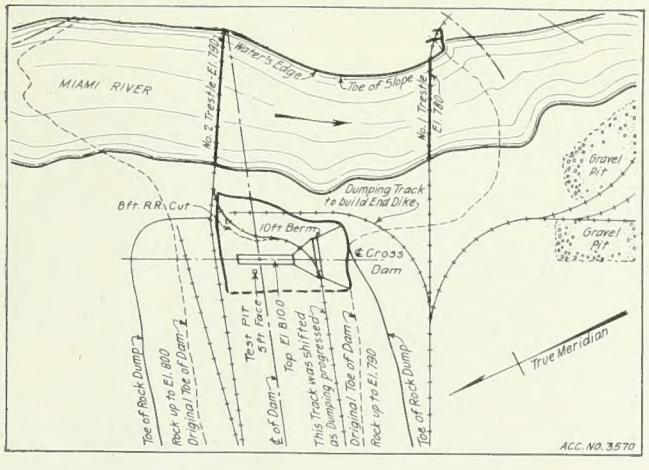


FIG. 86—LAYOUT FOR BUILDING CROSS DAM

The new method was suggested by Mr. G. L. Albert, Superintendent of the work of hydraulic fill, he having successfully employed it on the Catawba Dam, near Bridgewater, N. C., for settling dumped dry fill, and also for the same purpose, in building canal banks for mining operations in California.

The layout, shown in Fig. 86, in its main features was the same as that for the rolled fill. The material was dug from a borrow pit on the east bank of the river by a small Type 36 Marion steam shovel, loaded into 12-yard dump cars, transported across the stream on the down stream trestle by a 40-ton locomotive, and for the rolled fill unloaded by a dragline excavator into a hopper, whence it was conveyed in dump wagons to the point where it was to be spread and rolled, the track being along the east edge of the cross dam. To adapt this outfit to the plastic fill it was only necessary to remove the hopper, dump wagons and steam roller.

The substitute equipment was very simple. It consisted only of a small duplex steam pump drawing water from the river, and a 5-foot and a 10-foot length of ¾-inch gas pipe to take the place of the nozzle used in wetting down the rolled fill. Later the steam pump was dispensed with, water being obtained from the high pressure monitor line of the hydraulic fill equipment.

The operation also was simple. The material was dumped by the trains on the ground beside the unloading track. It was picked up by the dragline bucket and dropped in a windrow along the west side of the cross-dam site, but well within the west limit of it. This windrow was built up dry to a center depth of about ten feet. One of the ten-foot lengths of gas pipe was then connected by a hose to the steam pump and used in the manner of the needle of a hypodermic syringe, the nozzle piercing vertically to the bottom of the windrow, through a row of holes about two feet west of the top of the material, and about three feet apart. The water was thus introduced, by injection and percolation, throughout the west half of the mass, from the bottom to the top.

The effect was interesting. The material was dropped into the windrow, dry. The water introduced by the hypodermic made it plastic, and it began to flow slowly, like molten lava from a volcano, under the pressure of its own weight. The windrow being wet under its west slope, the flow was naturally in the direction of least resistance—west. This had been foreseen, and was part of the program. The west limit of the cross dam was out of reach of the dragline, from its necessary position in reach of the material dumped by the trains beside the track. By dropping continually fresh material on the top of the windrow—thus loading the top—the stiff dough in the west slope was kept in motion, very slowly, till it reached the limit staked out for it—the west limit of the cross dam. It thus transported itself, under the pressure of its own weight, a maximum distance of over forty feet. If it showed signs of "weariness," and began to slow up too much, a fresh injection of the hypodermic spur or a fresh load of earth on top, started it again. The motion was always, of course, exceedingly slow—glacial in fact, or as has been said, like lava—three or four feet or less, per day, and for practical purposes under control.

It should be understood that the procedure referred to was followed only on the west 40 feet of the cross dam. The remainder of the site, being in reach of the dragline bucket, permitted a simpler process and one requiring less careful watching. The general method was to build the cross dam up in 10-foot horizontal layers, the dragline travelling down the approximate longitudinal center line of the cross dam, on the layer just completed, and depositing the new layer behind it as it went. The

growing edge of the new layer thus sloped toward the machine, the fresh material being deposited on this slope, and each bucketful jetted as it was dropped. A flow of the fresh material was maintained by this means, of the nature already described, toward the dragline, the speed being a rough measure of the plasticity, and therefore of the water in the material. The flow was controlled in the manner already indicated, and could be completely stopped at any time by dropping a windrow of dry earth at the foot of the creeping slope, a procedure which at the same time corrected the excess water by gradually absorbing it.

It was excellent proof of the solidity of the embankment secured, that the dragline—a Class 14 Bucyrus steam machine with 70 foot boom and 2-yard bucket, and a working weight as given by the makers of 62½ tons—rode upon the structure without causing undue settlement. There was practically no time lost in grabbing for material which might try to creep from under and escape at the edges.

The strip of the cross dam referred to, 40 feet in width, lying out of reach of the dragline, was built up in layers like the rest, these layers all lying on about a 4-to-1 slope, the material in each layer being made to flow down this slope in the manner already described. The flow in each case was brought to rest at such a point that the west slope of the finished dam, although somewhat irregular, stood approximately on a 2-to-1 slope.

The total material in the cross dam is 45,330 cubic yards, of which about 35,000 was deposited by the plastic method. The total height is 42 feet. The hydraulic fill began on October 17, 1918, about a month after the beginning of the plastic fill. The cross dam was kept at a minimum of about 10 feet above the pool level, the maximum being about 25 feet. There was a little sliding into the pool from the cross dam material where the latter was carried across the center line (cut-off) trench, but not enough to cause any trouble. The work on the cross dam was stopped during freezing weather, in the winter of 1918-19, but the mildness of the season was such that the delay from this cause was not great.

As to reliability, two tests were made during the progress of the work which proved very satisfactory. A test pit, indicated in Fig. 86, was dug to a depth of about five feet. The walls of this pit stood vertical without sign of flow or break, the material damp, solid, and in texture like the cut surface of a cake of putty. At another time a railway cut, necessary for handling trains of rock fill across the damsite, was excavated in the cross dam. (Also shown in Fig. 86). The west wall of this cut stood eight feet high, on about a ½-to-1 slope, the exposed material resembling in dampness, texture and solidity the walls of the test pit, and like them without sign of flow or break.

A final word needs to be said about the material. This was largely made up of glacial till from the east river bank, containing a large percentage of clay, the whole giving a mixture which would permit the water to escape. The point needs emphasis. Too fine and retentive a clay, which hangs onto its entrained water, would no doubt give trouble if used for plastic fill. This was in fact discovered at the Englewood dam, where rolled fill proved to be best. The new process, like any other, has its limitations. Where conditions permit, it should have a considerable and perhaps a wide application. Of its value at Taylorsville there can be no question.

December Progress on the Work

GERMANTOWN

During the cold weather pumping of the hydraulic fill has been reduced about one-third in capacity. Considerable trouble was experienced in dumping the cars at the hog box, due to the freezing of the moisture in the air dump lines and the dumping apparatus in general. Nevertheless, during December, 47,300 cubic yards were pumped, which brings the total amount placed at the end of December to 371,000 cubic yards, this being approximately 47 per cent of the total hydraulic embankment to be placed.

Work during the past month on the hydraulic embankment has been confined to the upstream slope in order to reach a height that will insure safety against overtopping from the spring floods.

The dam embankment is now at Elevation 773. This is just 20 feet above the level which would be reached by a flood equal to that of 1898, and only 7 feet below that of a flood equal to the one of 1913. Ten full days of work will bring the dam to the latter level, giving a very large measure of flood protection.

Dumping rock on the upstream slope of the dam for future surfacing is being continued as part of the winter work.

Arthur L. Pauls, Division Engineer.

January 15, 1920.

ENGLEWOOD

Work on the hydraulic fill progressed under increasing difficulties due to cold weather until December 23. At that date the central pool had become encrusted with ice of such thickness as to interfere with properly depositing the core material. Also the extreme cold constantly froze the dumping apparatus on the dirt cars bringing material to the dam. While it would have been possible to continue intermittently with the pumping operations, taking advantage of favorable days as they came, the expense of such procedure seemed unwarranted in view of the results that would be obtained. During the month ending December 23, 59,200 cubic yards of hydraulic fill were placed, making a total to date of 1,002,160 cubic yards, or nearly 29 per cent of the total embankment required to complete the dam.

Since the shutdown of hydraulic fill the working forces have been engaged in constructing Sump No. 2 for use during the coming season. In addition, the plant has been given a general overhauling and such repairs made as to bring the various machines up to the highest point of efficiency.

The large electric dragline which has been constructing Cross Dam No. 1 has moved down into position and begun excavating the cut-off trench just east of the river, preparatory to driving steel sheet piling at this place.

New track lines have been laid in the borrow pits, including an approach to Sump No. 2.

H. S. R. McCurdy, Division Engineer.

January 15, 1920.

LOCKINGTON

Since work on the hydraulic fill was suspended for the winter on December 10, the reduced forces have worked on various odd jobs which were reserved for the cold weather. This work includes placing of rock on the dam slopes, clearing of timber near the dam, some work on Road 9, and a fence along Road 10. Repairs and alterations are being made on the steam dragline, gravel washing plant, and derrick at the sump in order to have them in first class condition for work in the spring. Arrangements were made for the use of an ice house at Lockington and an ample supply of ice has been cut and stored for camp use next summer at a cost of about one dollar a ton.

Barton M. Jones, Division Engineer.

January 17, 1920.

FIG. 87—BEACH AND SLOPE AT EDGE OF POOL, ENGLEWOOD DAM, MAY 26, 1919

This shows the sharp drop in the slope of the sand and gravel at the edge of the pool. This edge is normally at the top of the steeper slope seen in the foreground at the right, the pool water having been drawn down, at the time the picture was taken, about two feet. The picture shows also that most of the coarser material lies on the upper levels of the beach slope, toward the left, the part next the pool being mostly sand and fine gravel. There is almost no clay or silt in the beach, these materials being carried on into the pool. See pages 106 and 108. The larger stones near the pool margin are brought down the beach only in the larger streamlets of water.

TAYLORSVILLE

The Lidgerwood Dragline was delayed again last month because of a broken fair-lead, and also because of a broken I-beam in the main frame across the front end, but the output for the month was practically up to schedule.

Delivery of ballast to the B. & O. R. R. Relocation has been completed and the Bucyrus Class 14 Dragline has been tracked back to the north end of the pit, and overhauled ready to start excavating gravel for concrete as soon as the new delivery track to the west side of the gravel pit has been completed. In the meantime this gravel is being furnished by the Marion Class 70 machine.

The concreting has progressed fairly well in spite of the cold weather, the gravel screening and washing plant having been enclosed so that this work does not have to stop on this account. It has been found that our installation for heating the sand and gravel does not furnish enough heat to the fresh concrete in very cold weather if the washing plant is running; therefore a small boiler has been installed to heat the mixing water also.

O. N. Floyd, Division Engineer.

January 19, 1920.

HUFFMAN

During the month of December, 37,900 cubic yards of material were pumped into the dam, and 5,000 cubic yards of ballast gravel were delivered for ballasting the relocation of the Big Four Railroad. The delivery of this gravel was started on December 8th, and stopped December 17th, on account of freezing weather. During this time no material was pumped into the dam by the day shift.

On January 9th the hydraulic fill was entirely suspended on account of continuous cold weather. Necessary repair work is now being done on the hog box and all the equipment, so that it will be in first class working order when warmer weather comes, and the work can then proceed uninterrupted. During this shutdown, the installation of the booster pump is also being made, so that it will be ready for operation as soon as it is needed.

C. C. Chambers, Division Engineer.

January 17, 1920.

DAYTON

Channel excavation to date amounts to 682,500 cubic yards. The total pay quantity placed in levees and spoil banks is 479,300 cubic yards, including 60,000 cubic yards of levee embankment on Contract No. 41. In accomplishing this work a total of 1,222,900 cubic yards has been handled, not including excess depth channels.

The large dragline D 16-15 has completed its work on the Stillwater Avenue spoil bank. The machine is being dismantled and moved to a point above Stewart Street bridge, where it will be reassembled for work on Contract No. 43. D 16-16, the other large dragline, has done the necessary excavation for building "docking ways" above Third Street and is now engaged in lowering a gas main and a water main which cross under the bed of the river near the Third Street bridge. The caterpillar dragline D 16-19 is grading the top of the spoil bank between Herman Avenue and Webster Street. The erection at Sunrise Avenue of the dragline from Lockington, D-16-8, is continuing.

About 900 cubic yards of concrete have been placed to date in South Robert Boulevard wall.

Piles for the "docking ways" have been driven under contract with Price Brothers Company.

C. A. Bock, Division Engineer.

January 21, 1920.

HAMILTON

The total earth moved to January 1, 1920, including contract work, was 1,054,000 cubic yards. The total amount handled by the two draglines was 998,000 cubic yards. The total amount of Item 9 was 527,400 cubic yards.

The electric dragline is again working north of the Co-

lumbia bridge, loading material on cars. The output during December was low on account of cleaning up south of the bridge and moving around the east end of the bridge. There has been very little delay due to freezing weather.

The steam dragline has left the work at Old River temporarily and is excavating for the wall at the northeast corner of the Main Street bridge. It will also do the pile driving for this wall.

Concreting on the wall south of the Soldiers' Monument has been 95 per cent completed.

The work of concreting the tail race conduits under the B. & O. bridge has been completed.

C. H. Eiffert, Division Engineer.

January 20, 1920.

LOWER RIVER WORK

Miamisburg. Jeffrey, Boorhem & Co. have finished the work of raising and ballasting the Groendyke spur track. They have suspended earth-moving operations for the balance of the winter, but will keep a few men busy clearing the right of way for the levee on the east side of the river.

Franklin. Very little work has been done during the past month owing to unfavorable weather conditions. It is probable that Jeffrey, Boorhem & Co. will shut down until spring unless the weather moderates considerably in the near future.

Middletown. Cole Bros. have about 300 lineal feet of levee to construct before reaching the C. & D. Traction line at the point where the latter leaves South Main Street and starts across the Miami River. When this is finished, which will require about ten days, they will move back to Seventh Street and begin where they left off early in December on account of high water. There is 1000 lineal feet of levee to construct from this point southward, all of which will have to be moved twice by the dragline bucket.

F. G. Blackwell, Assistant Engineer.

January 15, 1920.

RAILWAY RELOCATION

Big Four and Erie R. R. Roberts Brothers have nearly completed the Big Four track from Enon to Dayton. Track-laying on the Erie R. R. has been resumed. The unfavorable weather has retarded the usual progress of this work.

The Walsh Construction Company have completed their grading contract and have closed up camp for the winter. They will resume ballasting as soon as the weather will permit.

All concrete work on the highway bridge at Huffman has been completed, with the exception of the hand rail. This will be constructed when the weather permits.

The steel superstructure for the Fairfield interlocking tower has been set. The tower will be of frame construction, and is being constructed by M. C. D. forces.

The Western Union Telegraph Company's forces have started setting poles along the Big Four's right-of-way.

Funderburg Brothers have stopped work on the right-of-way fence for the winter.

Ohio Electric Railway. Roberts Brothers have distributed two miles of track material on the new roadbed between Fairfield and Huffman. Ties for this work are now being shipped.

Baltimore & Ohio. All ballast has been distributed, but the finishing of tamping under the track has been suspended by the tracklaying contractors, Roberts Brothers of Chicago, until warmer weather.

The raising of the tracks south of Needmore yard, which work is being performed by the railroad company, is nearly completed.

The Western Union Telegraph Company has completed building the new line along the relocation and the wires of the old line have been removed.

Albert Larsen, Division Engineer.

January 21, 1920.

RIVER AND WEATHER CONDITIONS

The river and weather conditions for the month of December, 1919, were practically normal. During the first week the rivers were a little higher than usual, for this time of the year, due to the rainfall of November 25 to 29. The cold weather about the middle of December caused the formation of considerable ice on the rivers which has not entirely disappeared by February 2.

The total rainfall during December varied at the District's stations from 1.86 inches at Germantown to 0.49 inches at Ft. Loramie. The maximum 24 hour rainfall ocurred on December 6, varying from 1.00 inch at Ingomar to 0.27 inch at Ft. Loramie. At the Dayton Weather Bureau Station the total for the month amounted to 1.66 inches or 0.98 inches less than the normal, bringing the accumulated excess since January 1 down to 1.30 inches.

Observations taken by the local U. S. Weather Bureau show that at Dayton the mean temperature for the month was 26.7 degrees or 6.1 degrees less than normal; that there were 9 clear days; 7 partly cloudy days; 15 cloudy days, and 9 days on which the precipitation amounted to or exceeded 0.01 of an inch; that the average wind velocity was 10.7 miles per hour, the prevailing direction being from the southwest; and that the maximum wind velocity for 5 minutes was 38 miles per hour from the southwest on the 12th.

Ivan E. Houk, District Forecaster.

February 2, 1920.

Germantown Dam Now Up to 1913 Flood Level

It is gratifying to record that the elevation now reached at the Germantown dam, with the double capacity of conduits now in use, will protect against a flood like that of 1913. The discharge from the dam conduits with a flood at that level will be 22,000 second feet. In 1913 the Twin Creek flood discharge was 66,000 second feet. The two figures give the measure of the protection afforded by the dam in its present condition.

In this connection a study of the section of the Germantown dam shown in Figure 88 will be interesting. The shaded line below is the ground line. The full upper line gives the outline of the dam when completed. The broken lines give the height to which the embankment had been carried on the dates indicated. The super-elevation of the upstream levee is indicated on the December 23 section. The slopes inside the levees show the sand and gravel beaches. The black dots indicate the consolidated material in the pool bottom, each dot indicating the depth reached by a six-inch cast iron ball used as a sounding lead to measure the depth of water and mud in the pool. The ball came to rest at the points indicated by the black dots, after a settling through thickening layers of mud. It will be noted that in the middle of the pool the distance between the two lines of black dots is about the same as the distance between the two corresponding levels of the water surface in the pool, indicating that in this case the material in the dam core consolidated at about the same rate that the pool was raised. See also pages 106 and 107.

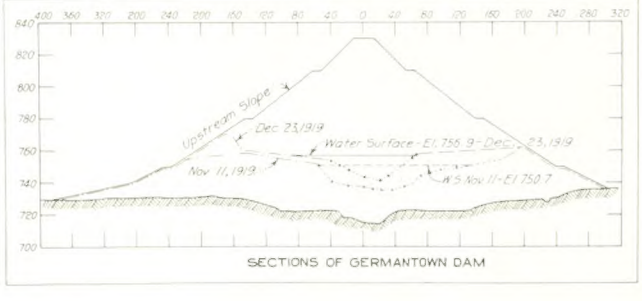


FIG. 88—PROGRESS SECTIONS, GERMANTOWN
The vertical scale is double the horizontal

Some Points Regarding Hydraulic Fill

The Process Automatically Separates the Clay and Silt from the Sand and Gravel and Deposits Each in Its Proper Place

In the original process of building a hydraulic fill dam, as developed from hydraulic mining methods in the far west, all the operations—excavation, transportation, and deposition of the earth in the dam embankment—were accomplished by means of water. Powerful jets from hydraulic monitors bored into the face of the "borrow pit," undermining and washing down the material into wooden flumes or "sluice boxes," which carried it and discharged it upon the top of the dam embankment, where the water automatically sorted and deposited the several constituents, each in its proper place in the structure.

At the Conservancy dams this process has been modified, in accordance with later developments, in several ways, which need not here be considered. In all of them the broad features of the deposition of the materials in the dam embankment are the same, and it is in regard to certain significant features in this process that the present article is concerned.

The simplest illustration of the process is perhaps exhibited at the Germantown dam, shown in Fig. 89. "Closure" of this dam has been effected. The body of the dam, partially finished, extends from hillside to hillside across the valley, completely blocking it, except for the concrete conduits, which carry the waters of Twin Creek under the structure. The entire embankment is being built up over its full length.

Certain main elements appear most clearly in this picture. In the foreground is the down stream slope of the dam embankment, extending across the valley, its top forming a levee enclosing one side of a rectangular pool of water. At its further side the pool is enclosed by a second levee, formed by the top of the upstream embankment slope, the latter dropping away (unseen) to the level of the valley bottom beyond. The two ends of the pool are enclosed by the two valley slopes.

The essential parts of what may be called the mechanism of the process are shown most clearly in Fig. 90, which shows the working section of the Englewood dam embankment as it appeared on August 26, 1919. The pool occupies the center. On each side of it rise very broad, flat, sloping beaches. At the upper edges of these are the bounding levees. Inside the levees, running down the length of the beaches, are two lines of steel pipe, discharging material upon the beaches at their near ends, and re-

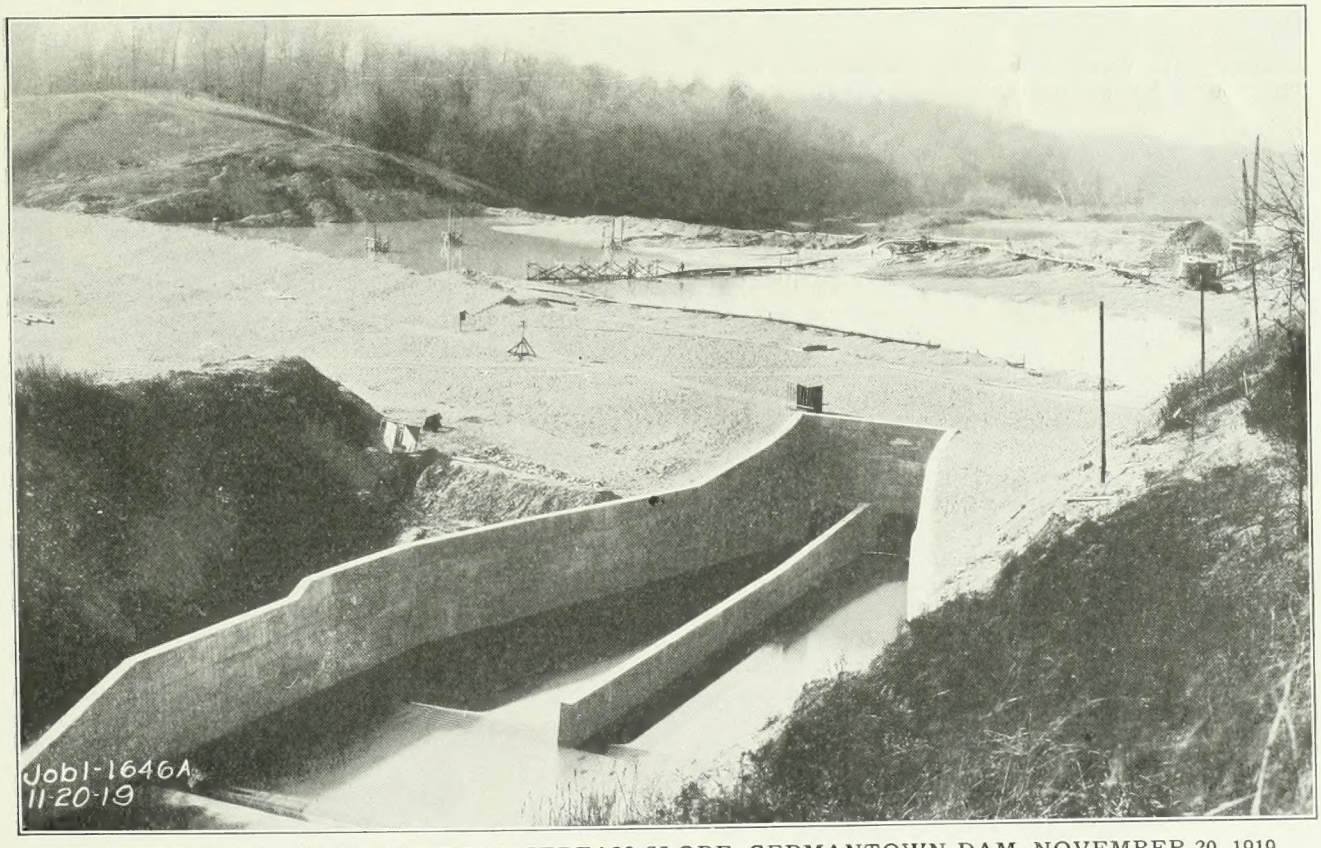


FIG. 89—POOL BEACHES AND DOWNSTREAM SLOPE, GERMANTOWN DAM, NOVEMBER 20, 1919

This shows clearly the relation of the pool and beaches to the dam embankment. In the foreground is the downstream slope of the dam. On the further side of the pool is the upstream slope, its upper edge being the farther levee. Twin Creek flows under the dam through the concrete conduits, whose outlet appears in the foreground. The partly built embankment extends from hillslope to hillslope across the valley, completely blocking it except for the conduits. The pool also extends entirely across the valley. The picture makes it clear that the core material of the dam, which is deposited from the clay and silt washed into the pool by the streams from the dredge pipe line, will occupy the entire middle part of it, from hill to hill, with sand and gravel banks or shoulders, built up from the sand and gravel beaches (see page 106), supporting it on its upstream and downstream sides. See Figs. 90 and 91.

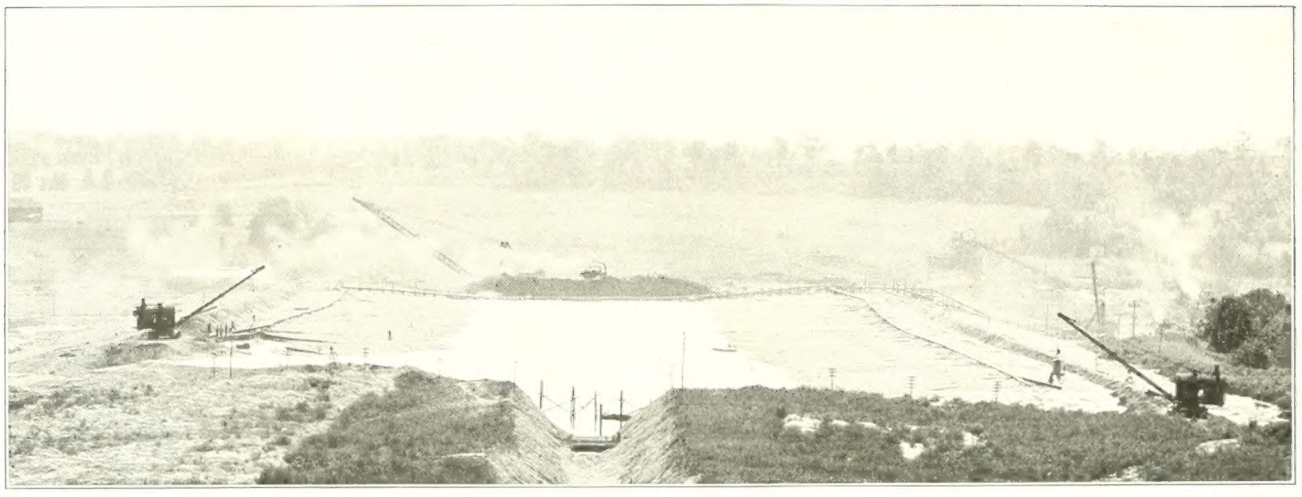


FIG. 90—CORE POOL, BEACHES, PIPE LINES, AND LEVEES, ENGLEWOOD DAM, AUGUST 26, 1919

This picture should be compared with Fig. 89, to get a clear idea of the relationship of the pool and beaches to the building of the dam embankment. The view is straight down the center line of the dam, from the east end of it, the "cut-off trench" on the center line appearing in the immediate foreground. The dark mass just beyond the pool is the rising embankment of the "cross dam" built along the east bank of the Stillwater River to enclose one end of the pool, the level of the latter being many feet above that of the river. Thus, what is seen is only that part of the Englewood Dam lying just east of the river. The embankment west of the stream has not yet been started. The levees are seen just outside the two lines of pipe at right and left. The top of the embankment, as far as it has been built up, extends between them in the shape of an exceedingly broad, flat trough, the middle of which is occupied by the pool and the slopes of it by the beaches. See pages 105 and 106.

ceiving the material at their farther ends, through other pipes connecting to pumps which are not seen. The pipes, the beaches, the levees and the pool may all be considered as parts of the mechanism of dam building, forming the top of the embankment in the shape of a very broad, flat trough, with the pool at the center.

This mechanism brings, sorts and distributes the materials which build up the embankment, the active agent being water, the process, in fact, depending upon the same carrying and sorting power of this element when in motion, which was discussed briefly in the Bulletin for May, 1919, in the article on the Erosion and Deposition of Sediment as Related to River Improvement. The effect of the mechanism is to separate the clay and silt from the sand and gravel, depositing the first two on the bottom of the pool, and the last two on the beaches.

The building up of the beaches is best shown in Fig. 85, which shows the discharge end of the right hand (upstream) pipe line at Englewood in Fig. 90. The discharged water carries gravel, sand and earth in particles and pieces of all sizes from impalpably fine material up to stones six inches in diameter, all driven through the pipe line at the rate of about 15 feet per second. Most of the large stones are dropped in a heap at the mouth of the pipe. The sand and gravel of smaller size are carried on down the slope of the beach in runnels and streamlets of varying size. These materials are deposited all along the slope of the beach, as may be seen in Figs. 85 and 87. As a rule this deposit grows finer as the streamlets approach the pool margin, where most of it will be sand. In the larger streamlets, however, some larger stones are rolled along and may be carried as far as the pool margin. Fig. 87 shows both facts quite clearly.

(Fig. 85 is shown at an early stage after the pushing forward of the pipe line, before the separation into the runnels and streamlets has become very well marked. Compare the discharge and flow in Fig. 98.)

On reaching the pool, a different action takes place. As the streamlet strikes the quiet water, it loses its velocity rapidly, and whatever sand or gravel it carries drops at once to the bottom, forming a slope which descends into the pool quite steeply. This is shown in Fig. 87, where the water has been drawn down about two feet in the pool, disclosing the underwater slope at the margin.

The extremely fine material, however, largely clay and silt, does not drop at the edge, but drifts out into the pool, and settles very gradually as a smooth slime to the bottom. The finest particles are carried on imperceptible currents throughout the entire mass of water, some of them never settling, but going on out through the overflow.

By this proces of separation, the bottom of the pool is built up of the very fine materials only. Analysis indicates them to contain about 85 per cent of clay and silt as against about 15 per cent of very fine sand, all three materials being impervious to water after consolidation. The pool being maintained at all times directly over the center line of the dam, its bottom gradually builds up into a "core wall" of these impervious materials, occupying the middle section of the dam, and extending from the bottom of the structure to the top and from one end of it to the other. Supporting this core wall at its upstream and downstream faces, will be broad, solid abutting banks or shoulders of gravel and sand, built up from the materials of the ever-deepening beaches. The core makes the dam water-tight. The shoulders support the core and give the entire structure solidity and stability, enabling it to resist the tendency of the water, which piles up behind it in flood seasons, to thrust it down the valley out of the way.

The division of the structure into core and shoulders, just referred to, is indicated in the two parts of Fig. 91, which shows cross sections of two different dams, one with a wide core and one in which the core is narrower.

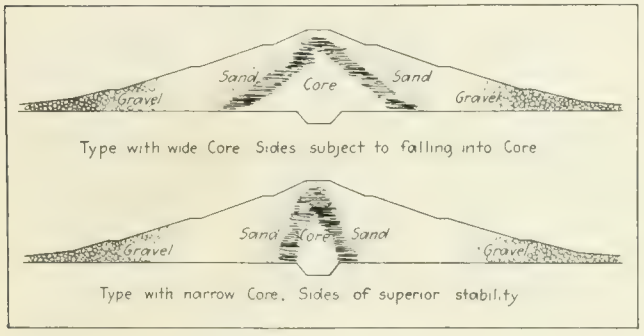


FIG. 91—STRUCTURE OF HYDRAULIC FILL DAM
Read Captions of Figs. 89 and 90

This figure illustrates also another point. Since the core is built up entirely of the fine materials, and the shoulders by the coarser sand and gravel, it is evident that by varying the relative amounts of the fine and coarse ingredients, the relative widths of core and shoulders can be correspondingly varied. Thus the materials used in building the lower dam shown in Fig. 91 would have a relatively much greater proportion of sand and gravel than the materials used in the upper dam of the figure.

It follows from the above that the width at which the core pool must be maintained will depend upon the relative amounts of coarse and fine materials supplied through the dredge pipe line. If the sand and gravel are in large proportion, as in the lower dam of Fig. 91, the pool must be narrow; if their proportion is less, the pool must be wider. This must be, since the core is formed by the building up of the pool bottom, and the only way to widen the core is to widen the pool correspondingly. The pool is maintained at a constant level by an outlet channel placed at some convenient point, which leads the overflow outside the dam embankment as fast as the water comes in through the dredge pipe. The pool is narrowed by lowering the level of this outlet, thus lowering the pool level, and drawing the pool edges down the beach slopes to narrow limits. In the same way raising the outlet carries the water up the beaches, widening the pool and with it the dam core.

Consider the case of the upper dam, Fig. 91, carried to an extreme, giving a very wide core supported by very narrow gravel shoulders. The core materials, in fact, consolidating very slowly, much of the core, if the dam is rapidly built up, would be rather plastic, and would act somewhat like a liquid, exerting side pressure upon its confining walls of sand and gravel. This pressure increasing as the dam is built up, and the sand and gravel shoulders being thin, the latter might give way, and let the core materials flow out above or below the dam. In case of some hydraulic fill dams, such an accident has indeed occurred.

It should be clearly understood, however, that such a failure no more argues against the validity of the hydraulic fill method, than the failure of a concrete arch, such as sometimes occurs, argues against the validity of concrete arch construction. In either case the failure is due either to improper design or improper workmanship. In case of the hydraulic fill the failure may be avoided by careful provision that the earth used to make the dam does not contain an excess of fine materials such as may lead to accidents like those referred to.

This precaution has been carefully observed at the Conservancy dams, the relative width of the core material in which is approximately represented in the lower part of Fig. 91. The established rule at these dams is to make the core width approximately equal to the distance from the top of the dam down to the elevation to which the core has been carried. This makes the core at the base occupy only about one-eighth of the total thickness of the dam, this proportion becoming somewhat greater at higher levels, but never exceeding one-fifth.

FIG. 92—BUILDING LEVEE AT ENGLEWOOD DAM, JULY 28, 1919

The machine is a Type 36 Marion dragline excavator with 40 or 50-foot boom and 1½ cubic yard bucket, which is used to build the north levee at Englewood. A similar machine builds the south levee. These machines, as may be seen, run on "caterpillar traction," like the tanks used in the late war. The pipe line brings the material for building the dam embankment, the discharge being next the machine. The dragline bucket picks up the stones and gravel dropped near the mouth of the pipe and builds them into the north slope of the dam embankment (at the left and beyond the machine) and also into the levee. The latter is built to keep the water discharged by the pipe from running down the embankment slope instead of the beach. The finished levee may be seen at the left of the little house. The latter is the telephone booth referred to under Fig. 85.

The Process of Deposition

It will be worth while to study this process more in detail. The entire dam embankment, including levees, beaches and pool bottom, is carried up in successive stages, a few feet at a time, the lift depending on the rough slope. At Taylorsville, since the latter is flat, the lift is 2 feet. At Lockington, where the slope is steeper, it is 4 feet. Usually, both beaches, both levees, and the pool bottom are carried up simultaneously, material being brought and delivered on the embankment through two sets of pipe, one running down the length of each beach, parallel to the levees, as seen in Fig. 90. Sometimes, however, the beaches are carried up alternately. It will be simplest to consider the process of carrying up one beach through one stage.

FIG. 93—WINDOW PIPE FOR BUILDING LEVEE, GERMANTOWN DAM, JANUARY 28, 1920.

These pipe, shown also in another view on the opposite page, differ only in detail from the window pipe at Taylorsville, described on pages 109 and 110. The pipe are so named on account of the rectangular openings cut in each length, through which part of the material coming from the dredge pumps drops to the ground below. These windows are so located that when the pipe are connected up they are all in the bottom of the pipe line. Several streams of water, mixed with sand and gravel, may be seen issuing from the windows, both in this picture and the next. The method of supporting the window pipe on the trestles built of posts and cross pieces, appears clearly. These trestles are not removed, since the materials are not worth the expense, but are left in the levee, where they do no harm.

The process will usually begin at one end of the pool, as the far end in Fig. 85, or Fig. 84, being that end at which the pipes arrive which bring the material, the mixed earth and water, from the "dredge pumps." Suppose the lift or fresh layer of sand desired is to be 4 feet thick, as at Englewood. The first length or two of pipe will be laid on sticks or horses, with the pipe bottom 4 feet above the old beach. The pumps are then started, bringing the material. The coarse stones build up in a heap at the mouth of the discharge pipe, as already described. The water and other material flow away down the slopes of this heap in all directions, and then down the beach slope to the pool, in streams and streamlets of various sizes. Flow down the outer slope of the dam embankment is prevented by the levee. (See Fig. 85). The fresh material is thus built up into a very broad, flat cone, whose top is at the point of discharge. Shear boards set up [illegible] to direct the streams so as to carry most of the material toward the pool, where it will be deposited on the wide, flat beach.

In this process, the beach near and under the pipe line at the point of discharge is soon built up to the level of the pipe bottom, giving it at this point the additional 4 feet of thickness desired. When this stage has been reached, a fresh length of pipe is added, laid directed on the material just deposited. A new heap of stones is now built up at the discharge end of the new pipe length, a new cone of sand and gravel laid down, in repetition of the process just described. Thus pipe length by pipe length, what may be called the "cone of deposition" is carried down the length of the beach, till the farther end is reached.

The pumping of material is then stopped, and the pipe line is moved, joint by joint, back to the starting end, each pipe length, as it is loosened, being laid down on the beach where it was used, ready for a fresh run, the entire beach being now 4 feet higher than it was at the beginning.

The adding of pipe lengths is simple. The pipe come in 16-foot lengths (as used on the Conservancy dams), either 12 or 15 inches in diameter, of 8 gauge high carbon steel (a little less than 3/16 inch —0.17185 inch), each length weighing 440 pounds. One end of the length is flared slightly, so that each pipe will slip inside the next at the joints like stove pipe. The joint is kept tight by wire loops passing behind ears on each pipe near the joint, the loops being tightened by twisting with a wire nail or spike after the fashion of a tourniquet. If leaks appear at the joints, they are easily caulked with bits of shingle wedged in.

The slope of the beaches is determined by the sizes of sand and gravel in the embankment material. If the finer sizes predominate, more of the material will be carried to the lower levels of the beach, and less deposited on the upper, making the slope flatter. If the coarser sizes are in greater proportion, more material is deposited on the upper levels and the slope is steeper. The beach at Taylorsville, Fig. 96, is an example of the first case, and that at Lockington, Fig. 84, of the second.

When both beaches have been raised the full lift—4 feet in the case considered—the water in the pool is raised by the same amount before the next lift is added to the beaches. Otherwise, of course, the pool would fill up, since fine material is continually being deposited in the pool bottom at the same time that the sand and gravel is being de-

posited on the beaches. The pool level is maintained constant during any lift by permitting excess water to run out at the end farthest from the pumps through some sort of temporary spillway, which discharges it outside the dam embankment. The raising of the water level in the pool is accomplished by raising this spillway outlet, at each beach lift.

The deposition of the fine materials on the pool bottom—the clay and silt which will form the dam core—is a very different process from that of the sand and gravel on the beaches. The sand and gravel are deposited quickly, during the time occupied by one of the streams of water in running from the discharge pipe to the pool, the last pieces dropping on the steep slope already described, leading down into the pool from the edge of the beach. The minute clay and silt particles, however, drift out into the pool as dandelion seeds sail in still air, losing very rapidly the velocity which carried them down the beach slope, and borne slower and slower on the sluggish set of the pool toward its outlet, or on other very slow currents created by wind, while they sink toward the bottom. Most of these particles would pass a 200-mesh cement screen. The finest drift to all corners of the pool, making it turbid throughout. There is considerable evidence, however, that most of them are deposited within a comparatively short distance of the point where they enter the pool; this distance depending upon the nature of the material, its specific gravity, and its degree of fineness.

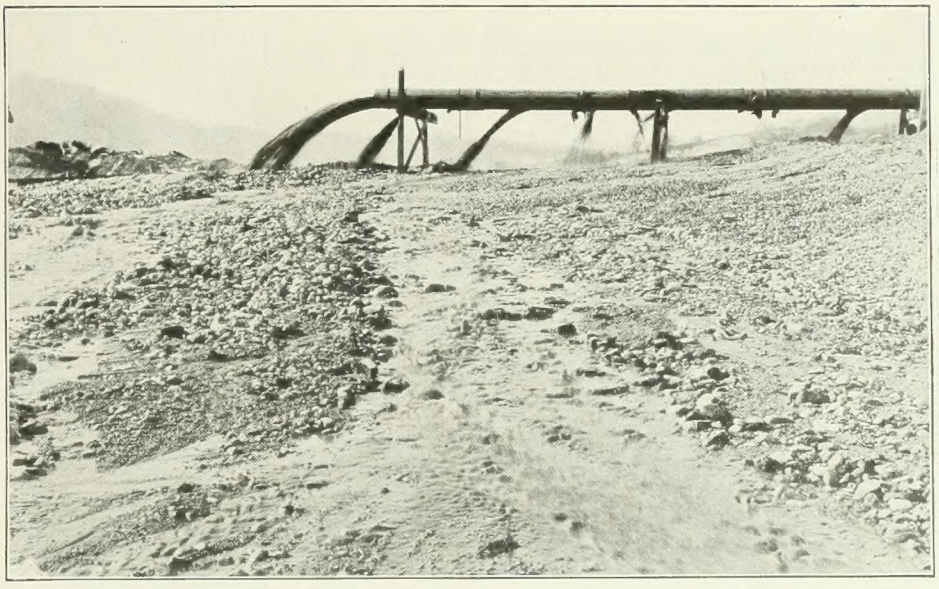


FIG. 94—GERMANTOWN WINDOW PIPE, ANOTHER VITW, JAN. 28, 1920

The view is from the other side of the same pipe shown in Fig. 93. The flow here is down the beach toward the pool, the flow in Fig. 93 being away from the pool. It will be noted that a plank, known as a sheer board, has been placed in the path of the water in Fig. 93 to direct it back again down the beach to the pool and prevent its washing down the outside slope of the embankment. The pictures show the process at an early stage after the pipe have been pushed forward for a fresh run. Very little material has yet been dropped at the mouth of the pipe. This material builds up in piles under each window and is raked and shoveled by the men into the levee, which runs parallel to the line of pipe and only a few feet from it.

Building Up the Beach Levees

The object of the levees is to prevent the streams of water, as they issue from the dredge pipe, from running down the outside slopes of the dam embankment, and washing away the materials composing it. They are built of the gravel dropped under or at the end of the pipe line, the method employed being adapted in each case to the particular conditions encountered.

At Englewood the materials come to the beach through two lines of pipes, as already described, both operating at once. With two lines to attend to, the pipe gang are kept busy, and the additional labor necessary to build up the levees by hand would be too much for them. Under these circumstances a small dragline excavator is stationed on each levee for the purpose. These are Type 36 Marion machines, equipped one with a 40-foot, and one with a 50-foot boom, and with 1½-yard buckets. The beach is raised 4 feet at a run. The draglines precede the working dredge pipe outlets down the beach, scooping up sufficient of the coarse material deposited on the preceding run to build the levees. The latter are raised 8 feet at a lift—double the thickness of new beach deposit—the draglines thus taking one trip to the dredge pipes' two. This saves the machines unnecessary travel, by giving them a double stint on each trip. The draglines travel on caterpillar traction, the gravel beaches furnishing for the treads an ideal footing. The machines deposit the material in the levees and outer slopes of the dam embankment practically in place, so that little hand dressing is necessary.

At Taylorsville, for sufficient reasons, only one line of dredge pipe is in use at a time. To shift the pipe line quickly, in moving forward and back on the beach, about six men are necessary. In the intervals between shifts, these men would be comparatively idle. By the aid of "window pipe" they are enabled to build the levees by hand during these intervals, the windows delivering the material in a series of heaps distributed under the last few lengths of pipe, and close to the levee, where it can be easily raked or shovelled into place. A contributing factor, favoring the use of window pipe, is the greater percentage of fine materials at Taylorsville, both in the clay and in the gravel.

The window pipe are made from ordinary pipe by simply cutting in them rectanglar holes or windows, 4 inches by 6 inches in size, so located that when the pipe are connected, the openings are all in the bottom of the pipe line. Six lengths of window pipe are used, connected up next the discharge end. The pipe are 16 feet long, and three windows are cut in each length, one in the middle and one toward each extremity. This gives, when the pipe are connected up, eighteen rectangular holes, 4 inches by 6 inches in size, and spaced about five

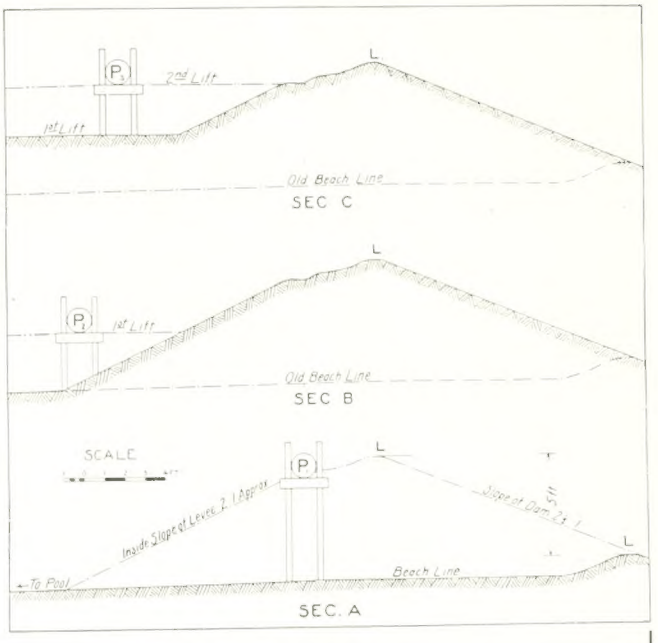


FIG. 95—STAGES IN BUILDING LEVEE WITH WINDOW PIPE, TAYLORSVILLE DAM

Successive stages in the process are shown in sections A, B, and C. In Section A, the top of the old levee L is shown at the extreme right. The window pipe is set up on top of a wooden trestle at P-1, with its bottom 5 feet above the beach line, and its center 4 feet toward the pool from the top of the new position L to which the levee is to be carried on the run about to be made. The broken line shows the limit to which the sand and gravel are built up on the first run down the beach, thus forming the new levee. The pipe line is then taken apart, length by length, back to the starting point, and a second run down the beach is made, the new position of the pipe line being indicated by P-2 in Section B, the now finished levee being cross hatched in this section. The bottom of the pipe, for this second run, is set only 2½ feet above the old beach line, and the beach is brought up to the level of the pipe bottom during the run. The pipe is then taken apart again back to the starting point, and shifted to a third position, indicated by P-3 in Section C, its bottom now being 2½ feet above the lift just completed, or 5 feet above the old beach line. A third run is now made down the beach, bring the level of the latter up to the pipe bottom and completing the cycle of operations ready for another 5-foot lift of the levee. The necessity for the double lift on the beach is due to the very flat slopes assumed by the materials at Taylorsville, as shown in Fig. 96 on this page. If the pool water were brought up 5 feet at a lift, it would run at Taylorsville 125 feet up the beach slope, widening the pool by 250 feet, and permitting core materials to be deposited on the lower beach levels, where they are not wanted. The beaches, which build up into the upstream and downstream shoulders of the dam embankment, must contain only sand and gravel. (See pages 106 and 107. and Fig. 91.)

feet apart, in the bottom of the last 96 feet of the dredge pipe line.

The material comes through the pipe at a speed of about 15 feet per second. The six-inch dimension of the windows being lengthwise of the pipe, this means that any piece of sand or gravel, as it passes an opening, has 1/30th of a second to make up its mind whether it will lrop through. Most of them keep on. In fact, only the finer sizes of gravel, with some sand, drops through the windows. With "eighteen holes to go," a considerable percentage—sufficient to build the levees—does drop, in eighteen convenient piles five feet apart, under the pipe line, and about 4 feet from the top of the levee to be built. From these piles it is raked and shovelled into place by the men.

The larger pieces of stone, bounding along the bottom of the dredge pipe on their way to the outlet, frequently land on the far edge of a window with a good deal of "punch," so that it becomes in time considerably battered up, as well as worn away. At Taylorsville, due to the fact that the larger sizes of gravel are in less proportion than elsewhere, this has so far not been a matter of importance.

At Taylorsville, in this process, the levee is built first and the beach afterwards, the work being done in three stages, shown in Fig. 95, in sections A, B and C. The details are explained in the caption of the figure.

Details of the levee building at Germantown, Huffman and Lockington will be given later.

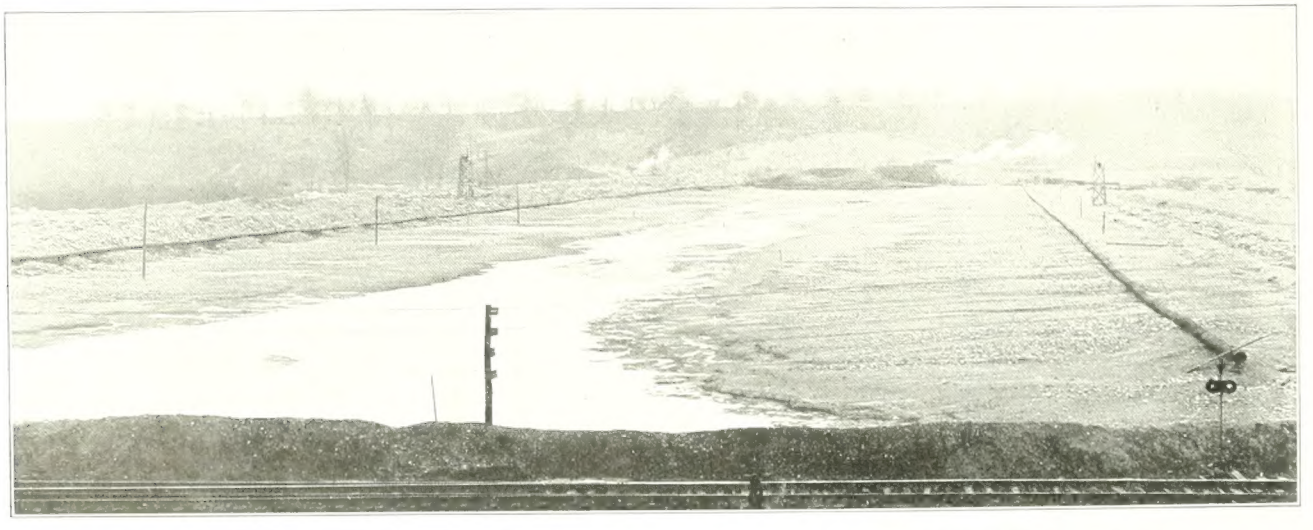


FIG. 96—CORE POOL AND BEACHES, TAYLORSVILLE DAM, DECEMBER 1, 1919.

FARMS FOR SALE

The District is offering an unusual opportunity to the farm buying public to purchase farms at attractive prices. These properties are located in good neighborhoods, with good land, schools, highways, steam and electric railroads, and a number of large cities and towns within a short distance. Any one interested in the purchase of farm land—for a home and business, or for investment, should look into the matter.

We list below eight farms which we have ready for sale, and will publish short descriptions of others from time to time as we get them arranged and priced. It will not be possible for us to publish descriptions of all our properties, however, nor to repeat the description of any particular farm the second time, so that one must understand that any farm list in the Bulletin gives but a small portion of our farm property on sale.

In Lockington Basin, Shelby County, the following:

Farm L-A Goffena Farm L-42

357.38 acres. Price $25,000.00

Good stock farm. Lies two and a half miles northwest of Houston, in Secs. 30 and 31. Nine-room frame house and smaller dwelling; main barn 50x75; stables, cribs and many other buildings. About two acres of orchard.

Farm L-J Marshall Farm L-48
Marshall Farm L-47

159.00 acres. Price $17,500.00

Good all-around farm. Located right at Hardin Station. Seven-room brick house; barn, 34x38; cow stable, 18x36; sheep house, garage, crib and wagon shed, hog house, etc. All good land. Deposit of gravel, which has a ready sale.

In Taylorsville Basin, Miami County, the following:

Farm T-A Demmett Farm T-71
Kester Farm T-72

189.28 acres. Price $28,000.00

An A-1 farm, three and a half miles east of Tippecanoe City, in Honey Creek Valley, and in Bethel and Elizabeth Townships. One two-story and one one-story house, bank barn, 40x72; stable, 14x20; crib, 28x48, and other buildings, all in fair condition. A large proportion of this property is good bottom and second bottom land.

Farm T-D Amanda Jackson Farm T-91

194.78 acres. Price $30,000.00

Three miles northeast of Tippecanoe City. Eight-room brick house; barn, 40x60; crib, 26x42, and other buildings, all in good condition. This is a well located and attractive property.

Farm T-C Marion Jackson Farm T-70

129.75 acres. Price $18,000.00

Three miles east of Tippecanoe City. Two-story frame house; barn, 40x84; crib, 26x40; hog house, 14x29; wood house, etc. All buildings may remain at present locations. A railroad switch will be built across the property, but will not materially decrease its value. Practically all the bottom land is of excellent quality.

Farm T-F Pickering Farm T-82

96.25 acres. Price $12,000.00

One mile north of Tippecanoe City, west bank of river, short walk from Dayton & Troy Traction stop. House, 36x48; barn, 36x62; tobacco shed, 36x72; three metal cribs, 12½x10. House in only fair condition. Other buildings in good condition. This farm is nearly all good bottom land. Just enough upland for buildings and pasture. A money-maker; located close to a traction line and a good town.

Farm T-E Ten Eick Farm T-90

160.89 acres. Price $20,500.00

Two and a half miles east of Tippecanoe City. Six-room brick and farm house; barn, cribs, hog house, etc., in fair condition. Mixed bottom, second bottom, and upland. A little stony at one end. This farm is well worth the price.

Farm T-B Benham Farm T-120

141 acres. Price $16,500.00

Four miles east of Tippecanoe City. Six-room brick house. Barn, 28x50; stable, 24x30; crib, 18x28; garage and other buildings. Upland red gravelly, good alfalfa land. Bottom mostly good bottom land. Pasture slope. This farm is a good buy at the price.

For particulars address:

The Miami Conservancy District
Farm Division
Dayton, Ohio

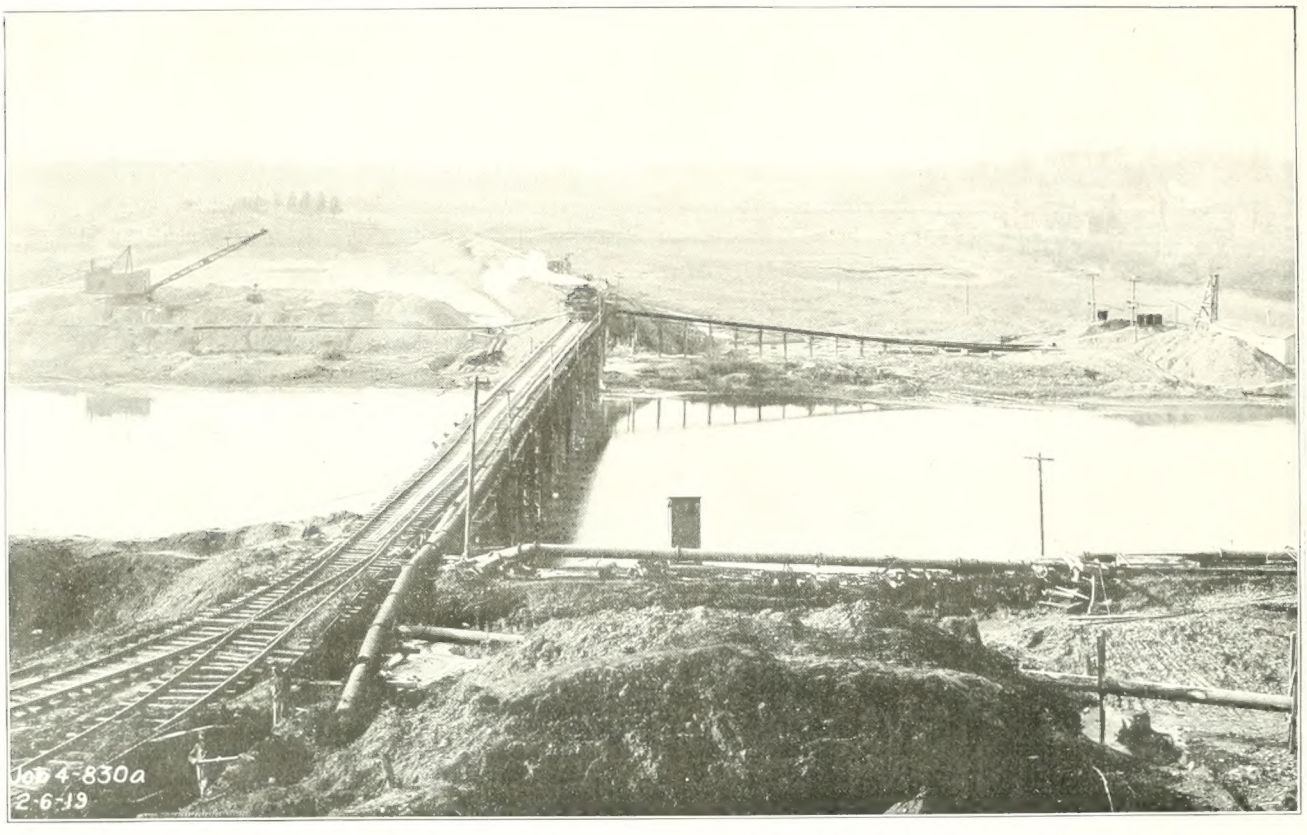


FIG. 97—PIPE LAYOUT AND CROSS DAM, TAYLORSVILLE DAM, FEBRUARY 6, 1919

The cross dam described on pages 101 and 102 is seen on the further bank of the river, at the left, with the dragline excavator at work upon it. The pipe layout comprises three systems. The high pressure line runs from the pumps (in the house at the right across the river) up to and across the river trestle, to the near bank, turning then to the right to the hydraulic monitor in the borrow pit (out of the picture). The sluicing line roughly parallels the monitor line, bringing additional water at low pressure to help wash the eroded materials down the borrow pit to the dredge pump. The latter forces the mixed earth and water through the dredge pipe line (nearest one at the right) back across the trestle, and thence to the left to the beaches at the dam. See page 105.

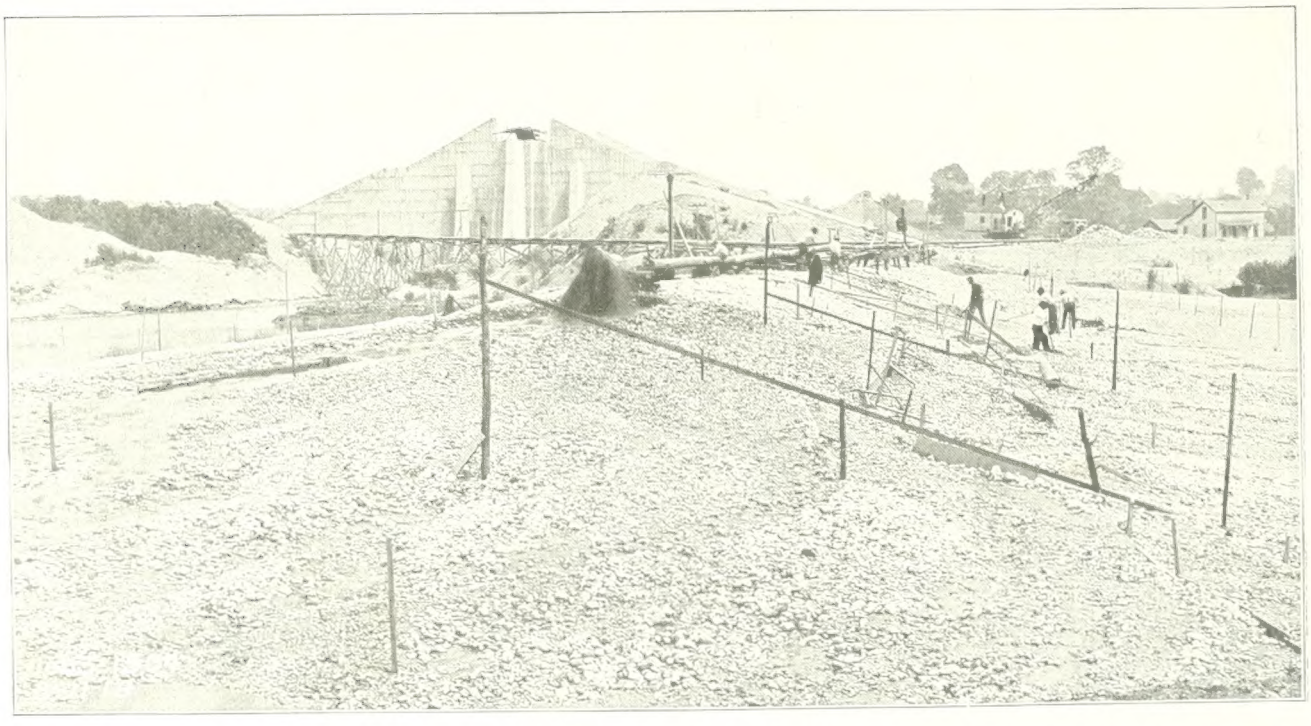


FIG. 98—BUILDING THE SOUTH BEACH AND DAM SLOPE, LOCKINGTON DAM, AUGUST 11, 1919

Shows the same beach as Fig. 84, taken on the same day from another point. The south slope of the dam embankment is being built up in the same manner as the beach (see page 106), a procedure not followed at higher elevations on the slope. The slanting boards indicate the finished slope of the dam embankment, the men raking and shovelling the sand and gravel flush with the lower edge of the board. The embankment will be carried up to the full height of the walls seen in the distance.